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5. System Changes to Accommodate the Band 1 Receiving Equipment

a. General

The equipment covered by this proposal is intended to fit physically within the same space and volume required by the present receiving system; however, there will be an extra receiving channel over that now available. It is obvious that numerous system changes will have to be made to accommodate this added feature. The system changes which will be discussed in more detail in subsequent paragraphs under this section deal with 1) changes in antenna sub-system requirements, 2) changes in audio programming/recording requirements, 3) changes in video programming/recording requirements, 4) changes in data-reduction equipment, and 5) changes in System 4 test set.

b. Antenna Sub-System Changes

(1) The Band 1 receiving equipment now used with System 4 receives input signals from an antenna sub-system consisting of two 17-inch spirals with associated isolation filters and switching relays. The same antenna sub-system, through the use of filters, also serves Bands 2 and 3. The 17-inch spirals will provide acceptable performance at frequencies somewhat lower than 150 mc although gain decreases. At even lower frequencies, the pattern now specified for such antenna sub-systems begins to deteriorate. However, it is estimated that, even at 50 mc, the effective gain (with respect to an isotropic radiator) would not be less than -40 db. With the receiver characteristics proposed herein, even gain which appears to be as insignificantly small as this will provide a reasonably sensitive receiving system. For example, even at 50 mc, such an antenna system could provide, at 300 miles positive lock-on against a c-w signal for a radiated power of less than 200 watts.

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(2) Antennas of somewhat larger aperture have been successfully developed by the contractor, but integration of such antennas into the present System 4 configuration would be extremely difficult without subjecting the system to some severe mechanical redesign. Even so, with larger aperture antennas, it would probably be necessary to eliminate the higher band (8, 9, and 10) capability.

(3) If the 17-inch spirals are retained, then the only changes required in the antenna system will be an addition of the necessary sub-band filters and additional antenna relays. A set of filters would be associated with each antenna for the Band 1 receiving equipment, and there would be one broadband preamplifier associated with each filter output which would cover the frequency range of 50 to 300 mc.

(4) It should be noted that there would be nothing to prejudice the use of antennas external to the system itself.

c. Changes in Audio Programming/Recording

(1) The use of an additional channel in the Band 1 receiving system will require added provisions for recording the AGC level as well as the digital data concerning frequency lock-on status and antenna-in-use. It is proposed to add the required circuitry in the programming equipment and to make such wiring changes in the rack as necessary to accommodate these added provisions. Since the frequency resolution of each channel will be much higher than that now afforded by the Band 1 receiving channels, extra bits will be added for all three channels. Instead of eight bits each for frequency, there will be 15. This will permit resolution, where required, to at least 10 kc.

(2) It is proposed to provide for recording the audio of the additional Band 1 receiver by making available the tape track

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now used for Band 8. The output of Band 8 will be applied to the same tape track used for the outputs of 9 and 10. The FM output of the added channel will be summed with the output of one of the two FM channels now used to carry four receiving bands each.

d. Changes in System for Video Programming/Recording Requirements

An additional gated amplifier will be required to permit processing of video data by the camera-indicator equipment. Changes in programming will be necessary to permit the video programming equipment to accept the additional channel as well as provide channel information on the data strip in the video recording process. (Elimination of crystal-video priority, as previously requested, could be accomplished at this time.)

e. Modifications in Data-Reduction Equipment

Modifications in data-reduction equipment would be required only within the M and N racks. Basically, the changes consist of the modifications necessary to handle the additional AGC and digital information, and to provide channel switching and indicating means for showing the existence and selection of the additional receiving channel. The work will involve the addition and modification of modules, as well as a change in panel switching and marking. It is proposed to provide means for either coarse or fine frequency-resolution with the three channels of the Band 1 receiving system. Additionally, by means of a panel-operated switch, the operator could look at either a coarse indication corresponding to the frequency resolution now available (eight bits) or at the least significant bits in the 15-bit words proposed for the frequency indication in the Band 1 channels. The frequency displays themselves would not be altered.

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f. Changes in System 4 Test Set

Changes to accommodate additional AGC data, digital information, switching, etc., will be essentially identical to changes required in the M rack.

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